ATOMIC ENERGY letter

THE FIRST AND ONLY ATOMIC [illegible]

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Dear Sir:

An international atomic research project is now to be sponsored jointly by Norway and Holland. A small atomic pile, already completed at Kjeller, Norway, by the Norwegian Institute for the Study of Atomic Energy, will be headquarters for the project. This pile, scheduled to operate this July, has a rating of 100 KW, and uses heavy water as a moderator, instead of the graphite used for that purpose in the British and larger U.S. piles. The seven tons of heavy water for this Norwegian pile were provided by Norway at a cost of £ 500,000, while the pile's 3 tons of uranium, costing £ 250,000, were provided by Holland. The pile itself represents three years of planning and building; design and construction was entirely by the Norsk Hydro company. The project is to be controlled by a commission of three Norwegians and three Dutch representatives. It is planned to utilize the pile for production of isotopes, neutron research, research on metals and other materials, and the peaceful applications of atomic energy. (Norway will thus become, apparently, the sixth country in the world to have a uranium pile. Others: United States, Canada, Britain, France and Soviet Union.)

The USAEC's 1952 fiscal year budget (for period June 30, 1951--July 1, 1952) has now been approved in Washington by the House, at $1,139,932,750.00. While it represents a cut (mostly in construction programs) from the original amount the USAEC had asked, it is still the largest peacetime USAEC budget. (Last week saw other funds for the USAEC, with its last supplementary appropriation for 1951 fiscal spending granted: $46,800,000.00. This fund will cover initial costs at a new facility at Hanford Plutonium Works, Wash., as well as several others, all of which are estimated to cost, in total, $78,164,000.00).

A joint American-British-Canadian conference on radiation detection instruments got underway April 30 at the Atomic Energy Research Establishment, Harwell, England. Seven representatives (5-USAEC; 1-Argonne Nat. Lab.; 1-General Electric) are attending. This Harwell conference, like previous ones in the Spring of 1949 and 1950, is being held under the technical cooperation program of the U.S., the U. K., and Canada. The conference will last two weeks, with the first week on design and application of radiation detection instruments. The second week the group will visit facilities of British instrument manufacturers.

The announcement that the USAEC had awarded in March, 14 new unclassified research contracts (6 in biology and medicine and 8 in physical research), and that it is now supporting a total of some 385 unclassified research projects (plus a large number of classified research projects), gives some indication of the extent of financial support by the USAEC, and its influence upon research in the United States. These 385 projects include 228 in biology and medicine, and 157 in physical research, and are carried on in colleges, universities, hospitals, and industrial and other private research laboratories.

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URANIUM: ITS OCCURRENCE IN THE UNITED STATES. A special digest, prepared for readers of this NEWSLETTER, of remarks by Dr. Phillip L. Merritt, Ass't. Dir., Raw Materials Ops., USAEC, before the Amer. Assoc. of Petrol. Geologists, in St. Louis, Mo., Apr. 26, 1951.

Uranium is the very heart of the atomic energy program. Although some of our domestic uranium production currently comes from vein deposits in igneous rocks, such as occur in the Marysvale Area, of central Utah, the sedimentary rocks of the Colorado Plateau provide most of our production. This area extends over 130,000 square miles in Colorado, Utah, Arizona, and New Mexico. Although in this area formations as old as the Pennsylvanian are exposed, most of the rocks vary in age from Permian through Tertiary, and uranium mineralization has been found throughout almost the entire sedimentary formation. Thus, the sedimentary rocks of the Colorado Plateau may be thought of as comprising a great uranium province. Formations of most interest to the USAEC at this time include the Salt Wash, the Entrada, the Shinarump-Moenkopi-Chinlo group, and the Tedilto.

In the Fall of 1950, a uranium discovery in New Mexico further extended the known geologic limits of mineralization in the Colorado Plateau. The initial discovery was made in the Todilto limestone formation of Jurassic Age, about five mines north of Prewitt, N.M. Uranium mineral concentrations are known to extend some 25 miles along the north side of the Zuni uplift where the Todilto forms a cap rock on the broad benches below the Morrison and Dakota formations. Individual deposits vary in size from a few tons to thousands of tons. They range in thickness from a few inches to eight feet, with an average thickness of approximately three feet. The uranium minerals identified to date include carnotite, tyuyamunite, sklodowsite, uranophone, and pitchblende, accompanied by flourite, pyrite, barite, and hematite.

In addition to the uranium deposits of sedimentary rocks in the Colorado Plateau, uranium also occurs in certain marine sediments in this country, particularly in black shales and phosphorites. Experience has suggested that the radioactivity of marine sedimentary rocks is commonly highest in the thinner portions of these formations, such as found along the margins of depositional basins. Many sediments of this type contain from 0.01% to 0.02% uranium, and similar values have been found in some of the Tertiary lignites in the northern Great Plains. Although these deposits present formidable recovery problems, they nevertheless represent huge potential reserves of uranium. The highest concentrations of uranium so far discovered in marine sediments occur in the Pliocene Bone Valley formation in Florida, and the Permian Phosphoria formation of Wyoming, Montana, and Idaho. These phosphatic formations are the principal sources for our phosphate fertilizer industry, and intensive metallurgical research has developed a process for the recovery of uranium as a by-product.

In the case of black shales, we have found that the highest grade deposits are the relatively thin Paleozoic shales, rich in both bituminous matter, and in sulphides. The Devonian and Lower Mississippian Chattanooga black shales of Tennessee and Kentucky are promising rocks of this type. We believe, however, that some of the pre-Cambrian black slates of Michigan, Minnesota, and Wisconsin, and the Paleozoic black shales of the mid-continent area, should be explored in far more detail than they have been to date. Such exploration, if intensively carried out, may well yield cheaply mineable deposits with a uranium content in excess of 0.02%. A large deposit of this type could well be of great importance to the United States.

Steps petroleum (and other) geologists should take so that uranium occurrences will not be overlooked, include: (1) Becoming familiar with known deposits of uranium, (2) Including a counter as an essential piece of equipment for mapping and startigraphic parties, (3) Checking sludge and cores of all drillings, and (4) Making and examining with care gamma-ray logs, particularly along margins of depositional basins.

NEW PRODUCTS, PROCESSES, & INSTRUMENTS...for nuclear work...

NEW PRODUCTS- A new shipping and storage container for cobalt-60 is now available in 9-and 12-inch sizes. A solid lead ball, it has a central cavity to hold a hexagonal aluminum capsule 0.5-in. x 0.75-in. long containing the cobalt-60. The cavity is closed with a lead plug. The balls are housed in a wooden box; the 9-in. size weighs 200-lbs., while the 12-in. size weighs 500-lbs.--St. John X-ray Laboratory, Califon, N. J.

INDUSTRY NOTES- The formation of a new, jointly owned company to manufacture an air filter, first used by the USAEC to keep radioactive particles out of the atmosphere, was announced by Arthur D. Little, Inc., Cambridge, Mass., and the Carrier Corp., Syracuse, N. Y. Headquarters for the new company, known as the Cambridge Corp., are in Syracuse, and initial production of the new filter is now underway. (This filtering medium is a special soft, feltlike paper, containing submicroscopic asbestos fibers which direct the air in such a manner that virtually all particles are entrapped in the fibers. Large sheets of this paper are folded in accordian fashion, and fitted into a frame, providing a large filtering surface in a relatively small space.)

Tracerlab, Inc., Boston manufacturer of nucleonic products, has taken an entire floor at 286 Congress St., Boston, primarily for electronic instrument manufacture, W. H. Barbour, Jr., company president has stated. One of the principle products to be manufactured there is the firm's "Radiac", a radiation detecting instrument. The firm has announced that this is the only instrument of its type now in mass production that has been approved by the Federal Civil Defense Administration. The instrument is also being produced in substantial quantities for the armed services.

A new pocket radiation meter that reads on the spot radiation and is slightly larger than a photographic exposure meter, but lighter in weight, is now being produced by the Raytheon Manufacturing Co., Waltham, Mass. Designed for use in actual war operations, the meter detects gamma rays, soft beta rays, and alpha particles. (The design of this meter, conceived at Oak Ridge National Laboratory, Physics Division, was submitted to the Raytheon company under contract last Fall. The Laboratory has contracted for about 20 of the instruments.)

ATOMIC ENERGY WORK ABROAD...England...

The first detailed description of the British Experimental Pile (BEPO), the larger of the two piles at the Harwell (England) Atomic Energy Research Establishment, has now been issued by the British Ministry of Supply. The fundamental design of BEPO was undertaken by the U.K. staff working at the Montreal Laboratory, Can., during 1945-6, and work was begun on the project early in 1946. In two years, the work had advanced to where Harwell could begin final tests and operation; the design maximum flux was reached by Christmas, of 1948.

The reacting part of the pile is a cube of graphite 26-feet on a side, through which pass 1,849 channels. Twenty uranium bars are included in each channel, leaving 3-feet of empty channel at each end. In addition to the main channels, the graphite moderator is perforated with holes for experimental purposes.

The main outer structure of the pile consists of a reinforced concrete and steel shell lined with 6-inch thick cast iron plates, and constitutes the biological shield for attenuating the intense radioactivity within the pile.

The pile is controlled by introducing four boron-carbide-filled hollow steel rods 2-inches in diameter horizontally into the side of the pile, so that, when fully inserted, the rods extend across the reacting cores. These rods can be accurately positioned from push buttons in the control room. In addition, there is a second system of ten similar rods, known as shut-down rods, operating vertically in the pile and having two positions only, right in or out. When both systems are fully inserted, the fission rate within the pile is about a milliwatt, since the boron in the rods absorbs thermal neutrons very strongly. The start up procedure is first to withdraw the shut-off rods, then the control rods to a position where it is known that the pile power will rise at a reasonable rate; when the desired power is reached, the rods are moved in until the indicated power level is steady.

IONIZING RADIATION...investigations, applications, & notes...

INDUSTRIAL- The detection of leaks in buried pipes, by using radioactive gases, has been investigated at the research department of the Detroit Edison Co., by A. Gemant, E. Hines, and E. L. Alexanderson. Both soft and hard radiation were studied in the work. Using a radioactive gas with soft radiation (carbon monoxide, from radiocarbon-14), it will be introduced at a suitable point into a buried pipe. Should the pipe have a leak, the gas will move in that direction, and at the leak will escape into the ground, where it will diffuse out in all directions. Detection of the gas, through bore holes in the ground over the line of the pipe, will then be used to identify the location of the leak. When using a radioactive gas emitting hard radiation (radon), it is similarly introduced into the pipe. After its escape, its progress may be detected by surveying the line with a counter.

MEDICAL- The use of iodine-131 red cell plasma ratio as a measure of thyroid function has been studied by K. G. Scott, J. C. Reavis, and W. E. White, of the radioisotope unit, Veterans Administration, San Francisco, Calif. It was found that the initial red cell-plasma ratio was the same in hyperthyroid, euthyroid, and hypothyroid patients, immediately after the oral administration of a test dose of I-131. However, the ratio dropped as the inorganic iodine test dose was incorporated into large molecules by the thyroid and returned to the blood stream. The experimenters note that the rate of drop of the red cell-plasma ratio is an expression of thyroid activity.

Development of thyroid neoplasms in the rat following a single injection of radioactive iodine were the subject of a study by R.C. Goldberg, and I. L. Chaikoff, of the University of Calif. School of Medicine, Berkeley, Calif. An examination of 10 rats sacrificed 18-months after a single injection of 400 micro curies of radioactive iodine revealed the following changes in the thyroid gland: (1) Hurthe-like elements were evident in the parenchyma of all glands (previous work by these researchers had shown these elements to be present in thyroids of rats sacrificed 8 months after a single I-131 injection). (2) Multiple adenomata, apparently benign in nature, were found in the thyroids of 2 rats. (3) Two types of anaplastic neoplasms, one of which was immediately adjacent thyroid tissue, were also found in the thyroids of these two rats.

CHEMICAL- The wide variety of radioactve isotopes now available (plus the extended use of all types of radiation counters) has made possible the attack of problems in colloid chemistry on an expanding front, Jack Schubert, Argonne National Laboratory, recently told the American Chemical Society at its annual meeting. Reactions between colloids and ion exchangers, metabolism of colloidal particles of varying dimensions in living animals, and mechanisms of catalyst poisoning by minute concentrations of foreign substances are among the phenomena amenable to study with these instruments and radioisotope techniques, Dr. Schubert explained. He cited the composition of mixed films on liquid surfaces, or changes in the thickness of surface films, as examples of work facilitated through the use of radioisotope techniques.

BIOLOGICAL- Dr. Schubert (above) also discussed the distribution of colloidal particles in the animal body, which have been studied by the radioisotope technique. As a result of improvements in the techniques, Dr. Schubert stated, it has been found possible to shift colloidal substances from place to place within the body. In the field of analytical chemistry, tracers can be used in paper chromatography to follow the paths of known materials, he explained. The methods are useful even in such applications as the spraying of insecticides, Dr. Schubert observed. The addition of radiomanganese to DDT formulations, he noted, allows measurement of the effectiveness of the distribution of the insecticide on surfaces measured, he pointed out.

NOTES- In its attempt to better acquaint industry with the usefulness of radioisotope techniques, the Atomic Energy Research Establishment (Harwell, England) has now started its first course in radiochemistry. The courses last one month. Pupils in the first class come from the research departments of rubber, sugar, diamond producing, and flour milling trade associations, while others are government scientific workers.

ATOMIC PATENT DIGEST...latest U.S. applications & grants...

APPLICATIONS- Ion gauge. A detector tube for an ionization gauge. Comprises gas exciting means adapted to operate in conjunction with a vessel which contains gas at a very low pressure. U. S. Pat. No. 2,548,283, issued Apr. 10, 1951; assigned to United States of America (USAEC).

Electric heating device. Comprises a metallic sheath containing a granular refractory filler material enclosing an electric heater wire. U. S. Pat. No. 2,548,423, issued Apr. 10, 1951; assigned to United States of America (USAEC).

Sensitivity modulation. An electronic recorder circuit for measuring the energy spectrum of fission neutrons produced by the bombardment of fissionable material by a primary burst of neutrons while preventing measurement of the energy of said primary neutrons. U. S. Pat. No. 2,548,449, issued Apr. 10, 1951; assigned to United States od America (USAEC).

Portable radiation detector. Comprises means to convert radiation into electrical impulses, and thereby to measure the extent of the radiation. U. S. Pat. No. 2,549,058, issued Apr. 17, 1951, to James M. Constable, Ozone Park, N. Y.

Radioactive locating means. Comprises positioning in a well borehole with respect to stratum penetrated by the borehole a solid pipe coupling carried by a casing. This coupling has homogeneously incorporated therein a radioactive material. The radioactive material is permanently disposed in the same position in the borehole with respect to the stratum penetrated. U. S .Pat. No. 2,549,109, issued Apr. 17, 1951; assigned to Lane-Wells Co., Los Angeles, Calif.

Detection of scattered neutrons. A method for determining the characteristics of a substance evidenced by the magnitude of the back scattering of neutrons. U. S. Pat. No. 2,549,176, issued Apr. 17, 1951; assigned to The Texas Co., N. Y.

PATENT NOTES- The claim of Arnold Pacyna, made to the USAEC, under U.S. patent 2,485,841, and asking for an award of $10,000.00 for the uranium ore refining process covered by the patent, has now been refused. The USAEC patent compensation board, after tests of the Pacyna process of refining uranium ore (made by Dr. R. Schuhmann, Jr., of MIT), found the Pacyna process inferior to refining processes now in use.

NEW BOOKS & OTHER PUBLICATIONS...in the nuclear field...

A Manual of Artificial Radioisotope Therapy. Edited by P. F. Hahn, Cancer Research Laboratories, Meharry Medical College, Nashville, Tenn. Presents in a practical manner salient information necessary for the therapeutic application of isotopes. A reference source for those who have a moderate background of the basic principles involved. Should have special interest for radiologists, internists, and surgeons desirous of using the new therapeutic techniques. 351 pages.- - Academic Press, Inc., New York 10, N.Y. ($6.80)

Determining Mosquito Flight Range with Radioisotopes, by Dale W. Jenkins, A report on tagging mosquitoes with radiophosphorous. 9 pages. -- U. S. Chemical Corps, Medical Division, Army Chemical Center, Md. ($1.25)

Organic Scintillators, by S. H. Liebson, U. S. Naval Research Laboratory. A discussion of techniques for the measurement of decay times of scintillations and ultraviolet excitation. 21 pages. Office of Technical Services, U. S. Dept. of Commerce, Wash., D. C. (75¢)

NOTE- The following USAEC publications are available from Office of Technical Services: Behavior of Stack Gases in Still Air (10¢); Biological Monitoring of Laboratory Area using Wildlife (10¢); Determination of Fluorine in Zirconium Metal; Development of Boron-Lined Neutron Counter Tubes; Elementary Chemical Processes in Radiobiological Reactions; Fast Neutron Data (25¢).

Sincerely,

The Staff
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